CLAIMS

1) Process for the detection of an object of an electrically conductive material or at least partially covered with such a material, characterized in that it consists in generated, by means of an inductance (3) correspondingly supplied, a magnetic field adapted to induce Foucault currents in said conductive material, when said object (1) is located at a suitable distance from said inductance (3), in abruptly cutting the supply and the current flowing in said inductance (3), in gathering the voltage and/or current signal induced in said inductance (3) by said Foucault currents after cutting, and in analyzing the characteristics of said signal or signals, particularly their decay, thereby to deduce information relating to the nature and/or thickness of the conductive material of the object (1) detected and/or the distance between said inductance (3) and said object (1).

2) Process according to claim 1, characterized in that supply of the inductance (3) is carried out by means of repetitive voltage pulses, the cutting of the current flowing in the inductance (3) being synchronized with the descending fronts of said pulses.

3) Process according to any one of claims 1 and 2, characterized in that it consists in connecting the inductance (3) to a supply unit (4), for example in the form of a pulse signal generator, during the phase of generation of the magnetic field by said inductance (3) forming field emitter means, and in connecting said inductance (3) to means (5 to 7) for acquiring and using

voltage signals induced in said inductance, for example in the form of a digitizing module, for processing and evaluation of said signals, during the magnetic induction phase by the decaying Foucault currents in the inductance (3) forming field receiver means, the two said phases being repeated for each signal pulse delivered by the supply unit (4).

4) Process according to any one of claims 1 to 3, characterized in that the acquisition of the voltage signal induced in the inductance (3) after cutting the current flowing in this latter, consists in sampling said signal over a time interval extending between 10 microseconds and 150 microseconds, preferably between 20 and 100 microseconds, after said cutting, and in carrying out an analog/digital conversion of the recovered samples.

5) Process according to any one of claims 1 to 4, characterized in that the analysis of characteristics of the voltage signal or intensity induced in the inductance (3) consists in determining the shape and the position, on a time diagram, of the curve of said signal at its bent portion or the value of at least certain predetermined points on this curve, in comparing these characteristics with memorized reference characteristics, for example predetermined during a preliminary phase of calibration, and in deducing the nature, composition, mass and/or thickness of the conductive material of the object (1) subjected to the influence of the magnetic field generated by said inductance (3).

6) Process according to any one of claims 1 to 4, characterized in that the analysis of the characteristics of the voltage signal or induced intensity consists in integrating said signal over a predetermined time period for duration and offset relative to the instant of cutting, then comparing the resulting integrated value with said memorized reference values, for example predetermined during a preliminary calibration phase, and in deducing thereby the nature, composition, mass and/or thickness of the conductive material of the object (1) subject to the influence of the magnetic field generated by said inductance (3).

7) Process according to any one of claims 1 to 6, characterized in that it consists in successively analyzing several induced voltage or current signals associated with several sequences of consecutive detection and in carrying out an overall evaluation of the characteristics of the different signals.

8) Inductive sensor device, particularly for the detection process according to any one of claims 1 to 7, adapted to detect and to permit the characterization at least partially of an object of an electrically conductive material, enclosing at least one portion of conductive material or at least partially covered by such a material, characterized in that it principally comprises an inductance (3) disposed in the active portion or surface (2') of said sensor (2) and adapted to generate a magnetic field adapted to induce Foucault currents in said conductive material, electrical supply means (4) for said inductance (3) and for abruptly cutting the current flowing

in this latter, means (5, 6) for acquiring the voltage and/or current signal induced in said inductance (3) by said Foucault currents after cutting, and means (7) for analyzing characteristics of said signal or signals generated by induction thereby to deduce information relating to the nature and/or thickness of the conductive material of the object (1) detected and/or the distance between said inductance (3) and said object (1).

9) Sensor device according to claim 8, characterized in that the electrical supply means (4) consist of a generator for voltage pulses, preferably of rectangular shape, and in that the actuation of the means for cutting the current flowing in the inductance (3) is synchronized with the descending fronts of said pulses.

10) Sensor device according to any one of claims 8 and 9, characterized in that the acquisition means comprise means (5) for sampling the induced signal at the terminals of the inductance (3) after cutting and means (6) for analog/digital conversion of the samples provided by said means (5).

11) Sensor device according to any one of claims 8 to 10, characterized in that the analysis means (7) comprises means for determining the shape and position of the time curve representative of the induced signal taken at the terminals of the inductance after cutting, means for comparing said characteristics with memorized reference characteristics, and means for deducing the nature, composition, mass and/or thickness of the conductive

material of the object (1) subject to the influence of the magnetic field generated by said inductance (3).

12) Sensor device according to any one of claims 8 to 11, characterized in that at least one inductance (3) is mounted in a protective housing or casing (8) hermetically sealed, preferably of stainless steel or a similar metallic alloy.